

# Actuation



**MASTER FLO**  
*The leader in choke technology™*

## Master Flo Valve Inc.

Master Flo Valve Inc. is the technological leader and world-class manufacturer of surface and subsea chokes, specialty control valves and supporting actuation.

Privately owned, proudly independent, and upholding a vision of excellence, our company structure offers the flexibility to adapt to ever-evolving market needs and developments, quickly and efficiently, providing you with the level of commitment you expect from a critical component supplier.

Since 1979, our goal has been to design and produce the highest quality chokes and control valves available in the industry, only equalled by our innovative engineering, creative R&D and outstanding quality assurance programs supporting the complete Master Flo product offering.

From our Edmonton facility of over 80,000 square feet located on 8 acres of land, we house in a single location our Engineering, Manufacturing and Research & Development teams, Aftermarket Support Group and facilities.

Our world-class facility embodies our commitment to product development and manufacturing excellence, playing a key role in our ability to maintain our position as the industry leader in choke technology.

Complemented by a global network of sales locations and service centers, Master Flo is positioned better than ever to support your local operations, wherever you are.

More than ever, the leading designs and material technologies utilized in the conception of our chokes are available to resolve your most demanding choke applications.

**When uptime is your main concern, you can turn to Master Flo, the leader in choke technology, for optimum performance and lower cost of ownership.**



Head office  
Edmonton, Canada



# accurate reliable valve control solutions

## Pneumatic actuation

- Piston (DA\*/SR\*)
- Diaphragm
- Stepping

## Hydraulic actuation

- Piston (DA\*)
- Stepping
- Surface or Subsea designs

## Electric actuation

- All voltages
- Subsea
- Surface
- Solar power
- Electrohydraulic power
- Fail-Closed models

ACTUATION

\* : Double-Acting

\*SR: Spring Return





# Double-Acting Pneumatic Piston

Designed specifically to handle the severe service applications seen on offshore platforms, this Double-acting pneumatic piston actuator has a proven performance track record. The actuator is environmentally sealed to reduce many of the corrosion effects common to the industry.



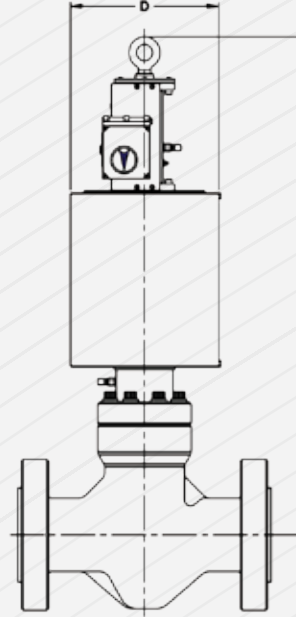
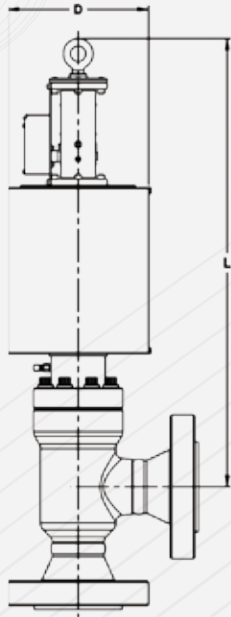
Operator safety and environmental awareness, always a concern at Master Flo, have resulted in a design with no exposed linkages. The double-acting piston operates on a minimum of 80 psi pneumatic supply providing a rigid control system for higher pressure choke valves. The internal spring provides fail-closed operation features upon loss of pneumatic or electrical signal.

*Master Flo Pneumatic Piston Actuators are suitable for use with a variety of positioners.*

Construction Materials	Carbon or low alloy steel
Piston Area	PDA 50: 46 square inches PDA 100: 91 square inches PDA 200: 185 square inches
Input Signal	3-15 psig, 6-30 psig, 4-20 mA, HART, fieldbus *
Output Signal	4-20 mA, HART, fieldbus
Supply Pressure	80 - 150 psig (5.5-10.3 bar)
Accuracy	± 1 to 3% full scale *
Certification	CSA/FM/UL explosion proof or ATEX intrinsically safe or flameproof *
Operating Medium	Instrument air, sweet instrument gas also available
Temperature Range	-20°F to +150°F ( -28°C to +66°C)
Fail Action	Spring-assist fail close - standard, fail lock also available

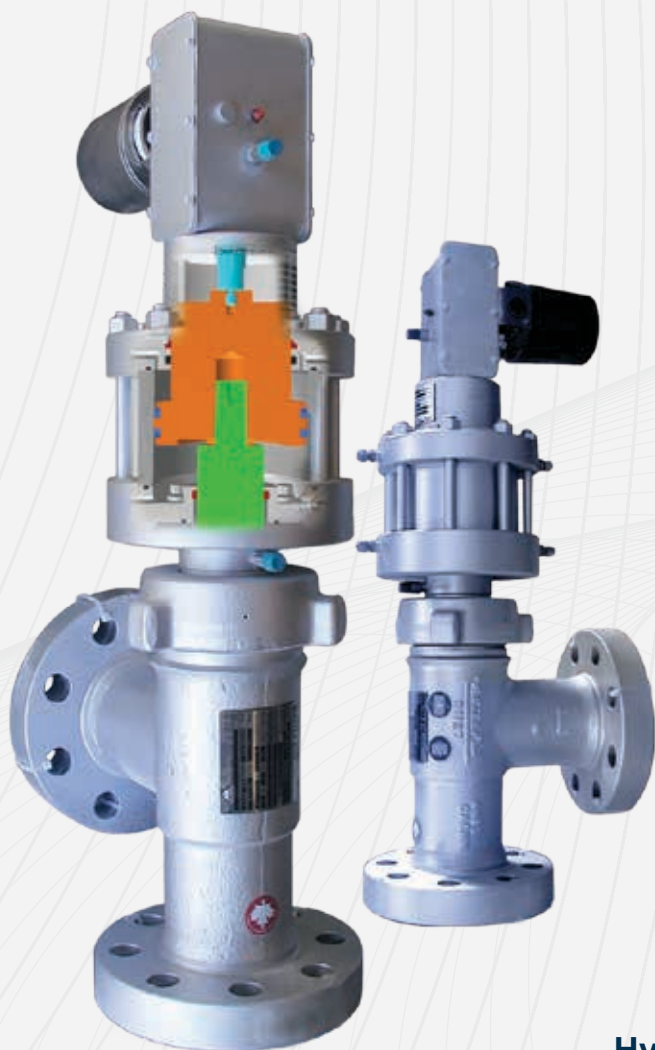
\* positioner dependent

The double-acting pneumatic piston actuator is available in three models to provide optimized selection. Units are available with single, double and triple-spring configurations depending on thrust requirements. All units can be supplied to meet CSA, UL or Atex certification and can be equipped with an optional manual override feature. Open yoke option available on request.



Valve Model	PDA 50			PDA 100			PDA 200		
	Weight = 70 lbs. [32 kg] D = 9.00 in. [229 mm]			Weight = 245 lbs. [111 kg] D = 12.25 in. [311 mm]			Weight = 385 lbs. [175 kg] D = 16.75 in. [425 mm]		
	L			L			L		
	in	mm	sv	in	mm	sv	in	mm	sv
P1E	27.00	686	-	-	-	-	-	-	-
C1E	28.28	718	-	-	-	-	-	-	-
P2E	27.28	639	-	34.89	886	-	34.89	886	-
C2E	29.03	737	-	36.64	931	-	36.64	931	-
P25E	27.35	695	-	34.93	887	-	34.93	887	-
C25E	29.10	739	-	36.72	933	-	36.72	933	-
P3E	30.28	769	-	38.12	968	-	38.12	968	-
C3E	32.59	828	-	40.44	1027	-	40.44	1027	-
P35E	-	-	-	43.36	1101	-	43.36	1101	-
P4E	-	-	-	43.36	1101	-	43.36	1101	-
C4E	-	-	-	47.11	1197	-	47.11	1197	-
P5E	-	-	-	45.69	1160	-	45.69	1160	-
P6E	-	-	-	49.45	1256	-	49.45	1256	-
P8E	-	-	-	-	-	-	54.06	1373	-

# Double-Acting Hydraulic Piston



The linear hydraulic actuator is custom designed for Master Flo chokes to provide the optimum thrust output required by our choke valve line. Designed to provide light, compact and efficient operation for choke valves, this 3,000 psi hydraulic supply actuator is a modified double-acting piston design.

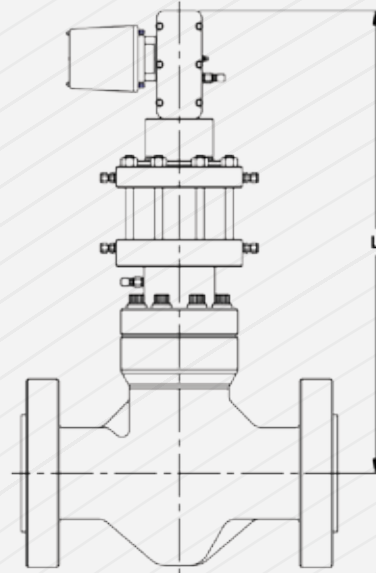
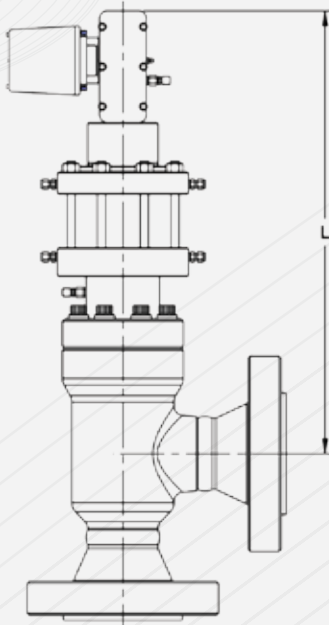
As with all Master Flo actuators, environmental protection and operator safety promotes a design with a sealed accessory drive mechanism and no exposed linkages. The actuator is normally equipped with a position feedback unit; however, an optional hydraulic control system can be fitted to allow the operator to input a 4-20 mA signal to position the choke.

Open yoke option is available on request.

## Hydraulic FC1/FC2/FC3 Specifications

Construction Materials	Carbon or low alloy steel	
Piston Area (square inch)	FC1: open: 8.8, close: 4.7 FC2: open: 20.1 (P2, P25), 17.7 (P3, P3-10K); close: 8.3 (all) FC3: open: 24.3, close: 12.4	
Input Signal	4-20 mA (with control system)	
Output Signal	4-20 mA	
Supply Pressure	1500 - 3000 PSIG	104.4 - 207.9 bar
Accuracy	± 1% of full scale (with control system)	
Certification	CSA/FM/UL: explosion proof or ATEX: intrinsically safe or flameproof	
Operating fluids	Mineral oil based hydraulic fluid (Brayco Micronic 864 standard)	
Temperature Range	-20°F to 150°F	-28°C to 66°C
Cleanliness Requirements	Minimum NAS 1638 Class 9 (with control system)	
Fail Action	Fail-close, fail open or fail last	

The double acting hydraulic piston is available in three models to provide optimized selection. All units can be supplied to meet CSA, UL or Atex certification and can be equipped with an optional manual override (hand pump) feature. The unique cylinder design can provide fail-closed, fail-open or fail-last position operation.



Valve Model	FC1			FC2			FC3		
	Weight = 40 lbs. [18 kg]			Weight = 80 lbs. [36 kg]			Weight = 120 lbs. [54 kg]		
	L			L			L		
	in	mm	sv	in	mm	sv	in	mm	sv
P1E	19.44	494	-	-	-	-	-	-	-
C1E	20.72	526	-	-	-	-	-	-	-
P2E	-	-	-	24.31	618	-	-	-	-
C2E	-	-	-	26.06	662	-	-	-	-
P25E	-	-	-	24.35	619	-	-	-	-
C25E	-	-	-	26.10	663	-	-	-	-
P3E	-	-	-	27.78	706	-	-	-	-
C3E	-	-	-	30.09	764	-	-	-	-
P35E	-	-	-	-	-	-	40.22	1022	-
P4E	-	-	-	-	-	-	40.22	1022	-
C4E	-	-	-	-	-	-	40.22	1022	-
P5E	-	-	-	-	-	-	43.97	1117	-
P6E	-	-	-	-	-	-	41.41	1052	-
P8E	-	-	-	-	-	-	45.16	1147	-
P10E	-	-	-	-	-	-	49.53	1258	-



# Rotary Stepping



The Master Flo Stepping Actuator is designed to operate our P2 through P10 choke valves using pneumatic or hydraulic supply. The precision and high torque generated through the 36° incremental steps makes this actuator an excellent choice for higher pressure valves.

The actuator system has been subjected to extensive endurance testing and has a superior field performance record for durability and reliability. The operating principal consists of independent systems for the close and open cycle. Each system utilizes a spring cylinder to provide linear thrust which is converted into rotary action through the actuator mechanism.

This rotary action provides the torque necessary to rotate the standard stem nut operating the valve. This makes this actuator ideal for field conversion where manual valves are converted to actuated units.

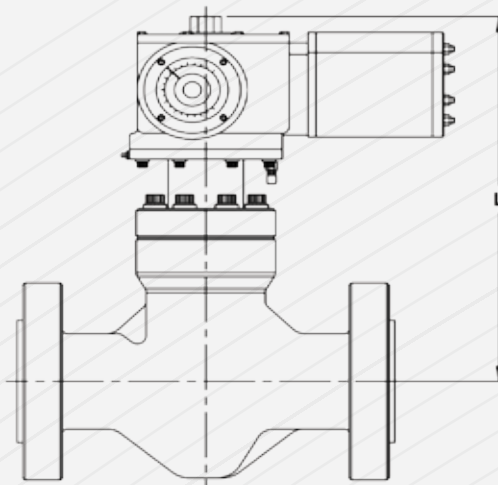
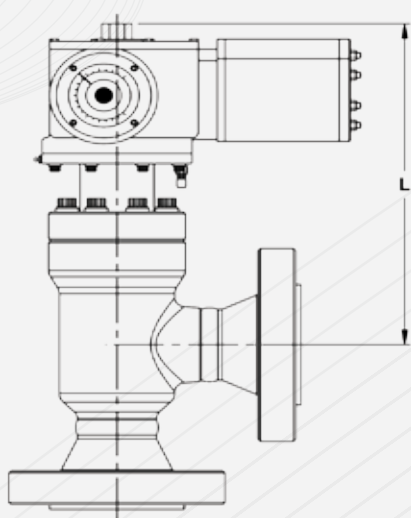
## Stepping Actuator Specifications

Actuator Weight	165 lbs	74.8 kg
Operating Temperature Range	-20°F to 180°F	-28°C to +82°C
Output Rotation per Step	36°	-2°/+ 2°
Rated Output Torque: Pneumatic Pneumatic high torque Hydraulic	160 ft-lbs @ 100 psig 310 ft-lbs @ 100 psig 320 ft-lbs @ 3,000 psig	216.9Nm @ 7.9bar 420.3Nm @ 7.9bar 433.9Nm @ 207.9bar
Operating Supply: Pneumatic Pneumatic high torque Hydraulic	150 psig max 100 psig max 3,000 psig max	11.4 bar 7.9 bar 207.9 bar
Air Consumption	2.6 scfm (std.), 5.1 scfm (HT*) **	
Hydraulic Consumption	1.3 cuin/step	
Operating Cylinder Connection	1/4" NPT, (1/2" NPT for HT*)	
Manual Override Drive	1 1/2" hex or optional handwheel	
Local Position Indication Scale	0-100% travel	
Position Transmitter Connection	3/4" NPT	
Position Feedback Resolution	± 0.5 steps	
Position Feedback Linearity	± 1.2% max	

\*\* 2 sec./cycle operating speed & 100 psig supply \* HT : High Torque



The rotary stepping actuator is available for a wide range of pneumatic or hydrologic pressure. This actuator is typically operated through solenoids in conjunction with position feedback supplied from a 4-20 mA position transmitter unit. This provides remote monitoring of the choke position. Optional positioner control systems are available which will allow the operator to input a 4-20 mA signal to position the choke. All units come with a 1 1/2" hex drive for manual operation or can be equipped with a declutchable handwheel.

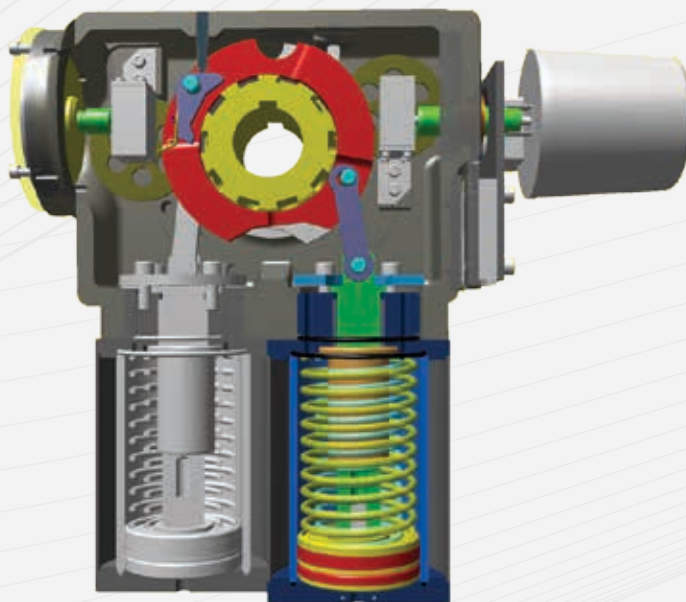


### Stepping Actuator

Weight = 165 lbs. [75 kg]

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Valve Model	in	mm	# of steps
P1E	-	-	-
C1E	-	-	-
P2E	16.83	427	110
C2E	17.20	437	110
P25E	16.83	427	120
C25E	17.20	437	120
P3E	20.39	518	170
C3E	22.70	577	170
P35E	27.11	689	160
C35E	30.86	784	160
P4E	27.11	689	200
C4E	30.86	784	200
P5E	28.59	726	225
P6E	32.38	822	270
P8E	32.59	828	335
P10	33.69	856	335



# Options



## Pneumatic Diaphragm

Master Flo prides itself on its versatility and ability to adapt to customer requirements, and third party actuation on our choke valves is another example of this commitment. Most Master Flo chokes are available with a wide array of actuator types and models as project requirements prescribe.

Shown here is one of the more common types, the Fisher diaphragm actuator, suitable for operation with 20 or 35 psi supply and fail-open or fail-closed configurations.

## Right-Angle Mounted Linear Actuator

For unique piping configurations or areas with space constraints, Master Flo offers a right-angle mounting hardware for linear actuators.

This option allows the operator to configure the actuator orientation at right angles to the valve stem axis. Since the hardware is fixed to the valve body, another benefit of this mounting is valve service. The actuator and its utility connections can remain in position when servicing the valve internal.



# Electric

Master Flo offers a wide range of electric actuation, from low voltage/low power to large high torque units, in a variety of certifications to meet our customers' needs.

We are able to provide complete solar-powered actuation packages, including:

- solar panels
- battery boxes
- controllers
- pole mounts

*We pride ourselves in finding the right electric actuation solution for you!*





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